

OUR BOOK SHELF.

La Statique chimique basée sur les deux Principes fondamentaux de la Thermodynamique. By E. Ariès. Pp. viii+251. (Paris: A. Hermann, 1904.) Price 10 francs.

Die heterogenen Gleichgewichte vom Standpunkte der Phasenlehre. Zweites Heft, erster Teil. By H. W. Bakhuis Roozeboom. Pp. xii+467. (Brunswick: F. Vieweg and Son, 1904.) Price 12.50 marks.

THE two volumes under review are concerned with the application of thermodynamics to the problems of general chemistry, but are yet so different in material and in treatment that few points of resemblance may be found between them.

In the book by Lieut.-Colonel Ariès the mathematical derivation of the laws of equilibrium from the fundamental principles of thermodynamics are stated in the most abstract and general form with just sufficient exemplification to indicate the bearing of the deductions on the practical work of physical chemistry. The author uses as characteristic function the thermodynamic potential at constant pressure, and it may be said in a word that his deductions are as simple and concise as the case will allow, the introduction of useless conceptions and formulæ being scrupulously avoided. One noteworthy feature which might with advantage be imitated in other works on thermodynamics applied to chemistry is the postponement of the discussion of the perfect gas to a point in the last third of the volume. The student is only too apt in dealing with the involved formulæ of certain cases of chemical equilibrium to introduce unconsciously into his equations some result which has its origin in a consideration of perfect gases, thereby obtaining a simple result apparently general, but in reality not so. The temptation to do this is greatly lessened by the simplification of the perfect gas being delayed until the general formulæ are well developed. The book is well and clearly written, and those interested in mathematical chemistry will be thankful for this lucid exposition of the subject.

The first part of Prof. Roozeboom's book has already been noticed in NATURE. It dealt with the equilibria of systems of one component. The present volume deals with the equilibria of binary systems, though such is the wealth of material that it has been found necessary to reserve the discussion of many systems presenting special features for a subsequent volume. In contradistinction to the work of Colonel Ariès, there is scarcely a mathematical formula to be found in Prof. Roozeboom's treatise; the graphic method is used to the practical exclusion of others. In the present part there are 150 diagrams, chiefly of curves the co-ordinates of which are pressure, volume, temperature, and composition in some combination. As in the first part, the various equilibria are carefully classified according to the nature of the phases involved, and each class is discussed in detail with the most painstaking completeness, and with full reference to the original sources of the experimental work used in illustration. In general terms the volume may be said to deal with simple solutions, and no one whose interest lies in this direction can afford to dispense with the aid of such a valuable guide to the work already accomplished, and to the theory of the practical work still to be performed. J. W.

The Timbers of Commerce and their Identification. By H. Stone. Pp. xxviii+311. (London: William Rider and Son, Ltd., 1904.) Price 7s. 6d. net.

THIS work is sure to meet with a cordial reception and to be welcomed by all branches of the timber trade. The information contained in its pages is such that only an enthusiast and expert could bring together

with the cooperation of others interested in the growth and utilisation of timber in every part of the globe. In all 247 different species are described, even to the minutest detail. In each case the specific name and authority are stated, and, wherever necessary, to avoid confusion, the synonyms have also been added. Then comes a list of the alternative names, or what we might call the common names. It is a well known fact that frequently one and the same kind of timber receives two different names, whereas two totally different species may be known by the same common name. The vernacular names in foreign languages, so far as they are not to be found in dictionaries, have also been quoted. Following this comes a paragraph dealing with physical characters, &c., such as recorded dry weight, hardness, taste, combustion, character of ash constituents, &c. The grain and bark are next described. The following paragraph deals with the uses to which the timber may be put. The colour is also given as a means of identification, and the anatomical characters, as seen in transverse and longitudinal sections, are fully described.

The author seems to have spared no pains in collecting and authenticating the vast amount of information and details necessary for the above purpose. A very valuable feature of the book are the illustrations, numbering 183 photomicrographs, which represent all the genera mentioned in the text, except where a single illustration serves for more than one genus. In most cases the photographs are taken from transverse sections, though in many cases longitudinal sections are also given. It is stated that the scale of magnification is three times the actual size, and is designed to show the appearance of a transverse section as seen by means of an ordinary hand lens. For those desiring further general information about wood a very useful bibliography is given at the end of the book. Also two appendices are added, which respectively describe the method and apparatus for measuring the amount of resistance in timber to impact and the absorption of water by a given area on any surface of a piece of wood.

At the beginning of the book a very interesting chapter, entitled "Practical Hints," is included, which we are sure will be read with much interest and profit by all those who work with wood. The index is a very complete one, and will render the book invaluable as a ready work of reference.

Verhandlungen der deutschen zoologischen Gesellschaft, for 1904. Pp. 252; illustrated. (Leipzig: Engelmann.) Price 11s. net.

THIS valuable publication contains the papers read at the twenty-fourth annual meeting of the society, held at Tübingen on May 24-26, 1904. The congress was opened by an address from Prof. Spengel, in which the society was congratulated on the good work it continued to produce, and especially on recent investigations on the structure of the Protozoa and on the relations of the nucleus to the general mass of protoplasm. To Prof. Blochmann was assigned the pleasant task of welcoming the society to Tübingen. The published papers are sixteen in number, in addition to which were numerous exhibits and demonstrations. Most of the former are of an extremely technical character, and to a large extent interesting chiefly to specialists. Among them we may refer to Prof. A. Brauer's account of recent investigations into the structure of the light-organs of the bony fishes, more especially of the deep-sea forms, in which the question of the relation of these structures to the lateral line system is discussed at considerable length. Dr. von Buttel-Reepen's article on the mode in which the larvae of the honey-bee are made to assume a particular sex is also one of considerable importance. In the course

of a discussion on the zoological system as commonly taught, Prof. H. E. Ziegler emphasises the view that the rhizopod and flagellate animalcules, together with the Sporozoa, form an allied assemblage, while the ciliated animalcules, both as regards the nature of the nucleus and the mode of reproduction, are altogether different. In a fourth important communication Dr. Bresslau amplifies and illustrates his discovery that the marsupium of the marsupials, in place of being a simple organ, is really formed by the amalgamation of a number of small pouches. These pouchlets, which at first form solid ring-like growths of the epidermis, soon begin to degenerate, and are merged in the wall of the marsupium. R. L.

The Optical Dictionary. Edited by Charles Hyatt-Woolf, F.R.P.S. Pp. x+77. (London: The Gutenberg Press.) Price 4s. net.

This is an optical and ophthalmological glossary of English terms, symbols, and abbreviations, together with the English equivalents of some French and German terms arranged alphabetically. The meanings are, as a rule, very clearly given, and the book should prove of use to students (especially medical students) who suddenly come upon an unfamiliar term in the course of their general reading. Of course, it must be understood that it is practically impossible to explain properly any scientific term in a line or two, and this is all that is attempted; the meanings given must therefore in most cases be somewhat unsatisfactory. But the book will doubtless succeed in its aim, especially in the translation of foreign terms. As regards accuracy—the *sine qua non* of a dictionary—we only notice a very few actual errors, e.g. *dioptrically* does not mean *by reflection*, and in the definition of *numerical aperture* the words *refractive index of the medium in which the object is immersed* scarcely indicate that the medium must extend into contact with the objective. *Underlant* is apparently a misprint for *undulant*, and one-third of p. 70 has got into its wrong place.

But these are not very important blemishes, and we cordially recommend the book to those whom it may concern.

Practical Professional Photography. Vols. i. and ii. By C. H. Hewitt. Pp. 126 and 114. (London: Iliffe and Sons, Ltd., 1904.) Price 1s. net each.

These two volumes form a very useful addition to the *Photography* bookshelf series, of which they form Nos. 17 and 18. Although the author does not profess to go into any great detail, he gives an excellent account of the necessary requirements of the professional photographer, from the choice of business premises, the handling of customers, book-keeping, &c., down to the packing up of the finished pictures and their dispatch. The chapters on portraiture, composition, and lighting are especially satisfactory, and many a valuable hint is contained therein.

A great number of illustrations accompany the text, and serve the useful purpose of illustrating the author's remarks on many lines of work.

Solutions of the Exercises in Godfrey and Siddons's Elementary Geometry. By E. A. Price. Pp. 172. (Cambridge: The University Press, 1904.) Price 5s. net.

This book will be found very useful to all, both pupils and teachers, who use the well known work of Messrs. Godfrey and Siddons. The solutions, 1836 in number, contain not only the deductive, but the drawing exercises, the figures being all such as the pupil is required to construct. We cannot refrain from pleading for a better figure of a hyperbola than that given on p. 143, which a trained eye rejects at once, although it is not essential to the pupil's work.

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LETTERS TO THE EDITOR.

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Average Number of Kinsfolk in Each Degree.

MAY I ask you to insert yet another brief communication on the above subject, because private correspondence shows that paradoxical opinions are not yet wholly dispelled? The clearest way of expressing statistical problems is the familiar method of black and white balls, which I will now adopt.

Plunge both hands into a dark bag partly filled with black and white balls, equal in number, and well mixed. Grasp a handful in the right hand, to represent a family of boys and girls. Out of this unseen handful extract one ball, still unseen, with the left hand. There will be *on the average* of many similar experiments, as many white as black balls, *both* in the original and in the residual handful, because the extracted ball will be as often white as black. Using my previous notation, let the number of balls in the original handful be $2d$. Consequently the number in the residual handful will be $2d-1$, and the average number in it either of white or of black balls will be half as many, or $d-\frac{1}{2}$. It makes no difference to the average result whether the hitherto unseen ball in the left hand proves to be white or black. In other words, it makes no difference in the estimate of the average number of sisters or of brothers whether the individual from whom they are reckoned be a boy or a girl; it is in both cases $d-\frac{1}{2}$. The reckoning may proceed from one member of each family taken at random, or from all its members taken in turn; the resultant average comes out the same.

This, briefly, is my problem.

FRANCIS GALTON.

On the State in which Helium Exists in Minerals.

IN 1898 I published in the *Proceedings* of the Royal Society the results of some experiments on the evolution of gases from minerals on heating them. I succeeded in proving that the hydrogen and carbon monoxide in the gases could be accounted for quantitatively by the reduction of water vapour and carbon dioxide by ferrous oxide, or by similar substances, and that, except in cases in which cavities could be proved to exist, the evolution of a gas from a mineral implied chemical change at the moment of heating. In the cases in which helium was evolved on heating a mineral, I pointed out that by the action of heat it is possible to obtain only half the helium, though the evolution of this gas never really ceases, but only becomes very slow. This I took to be evidence of the existence of a chemical compound of helium with some constituent of the mineral.

Recently (*Trans. Roy. Dublin Soc.*, 1904) Mr. Moss has shown that by grinding pitchblende *in vacuo* helium is evolved, and considers this result as certain evidence of the existence of the gas in the free state in cavities. Since, however, helium is evolved, though slowly, from the crushed mineral at a temperature not above 300°C ., the liberation of the gas in Mr. Moss's experiment may be attributed to local heating set up in the process of grinding.

In view of recent discoveries it appears to me that both of us have been on the wrong track in looking for an explanation of the phenomenon. As Sir William Ramsay and Mr. Soddy have shown, the presence of helium in the minerals may have resulted from the decomposition of radioactive matter, formerly present in them. Recently Dr. Jaquerod, of Geneva (*Comptes rendus*, 1904, No. 20, p. 789), has found that when helium is heated in a quartz bulb to a temperature above 500°C . the gas passes out through the quartz with a velocity which increases with the temperature. At 1100° , in a comparatively short time the pressure in the bulb fell considerably below that of the atmosphere. Hydrogen appeared to behave similarly.

This experiment shows that quartz, and probably substances of the nature of the minerals we are considering, though impermeable to helium at low temperatures, become permeable at moderately high temperatures, and furnishes us with a solution of the second part of our problem.